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100 Area River Effluent Pipelines Expedited Response Action Proposal

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P.O. Box 550
Richland, Washington 99352

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EXECUTIVE SUMMARY

A Hanford Federal Facility Agreement and Consent Order (Tri-Party) change order created a milestone requiring a Expedited Response Action (ERA) for the 100 Area River Effluent Pipelines (Appendix A). The U.S. Environmental Protection Agency is a co-lead agency and the State of Washington Department of Ecology is the other co-lead agency. This classification ERA is non-time critical. The proposal will follow the applicable sections of 40 CFR 300, Subpart E (EPA 1990), the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Appendix D, Work Schedule) (Ecology et al. 1993), the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, the *Resource Conservation and Recovery Act of 1976*, the State of Washington *Model Toxics Control Act* (MTCA), and *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA 1993).

The ERA goal is to remove and/or stabilize the 100 Area Reactor river discharge lines and outfall structures. The action should eliminate the physical and potential radiological hazards associated with deteriorating pipeline conditions.

From 1943 to the present, the Columbia River has been used as a water supply by the Hanford Nuclear Reservation. The reactors, except 100-N, used the river water mainly for primary reactor core cooling purposes. The 100-N system provided river water to a secondary water cooling loop. All primary reactor discharge pipes contain some residual radioactive contamination (UNC 1986).

The river discharge lines are part of each reactor's effluent system. Most lines stopped operating when the associated reactor was shut down. The K lines still service the K Area basins. The N line still services the 100-N Area.

Three alternatives were evaluated as part of the engineering evaluation and cost analysis. The alternatives are no action, pipe inspection and separate pipe work plans, and pipe removal.

The preferred alternative is to perform the Pipe Inspection and separate Work Plans. After phase 1 is completed, a "Phase 1 Findings Report" detailing the inspection results and recommended pipe remediation work plans will be issued. The report's work plans will include permit requirements, costs, and schedule. This appears to be the best alternative to protect the environment and be cost effective.

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1.0 SITE CHARACTERIZATION

1.1 INTRODUCTION

Public awareness of activities influencing the environment continues to draw considerable attention to the Hanford Site. Further environmental contamination and increased environmental degradation are common concerns.

This proposal presents information for conducting an Expedited Response Action (ERA) for the 100 Area River Effluent Pipelines (Appendix A). The U.S. Environmental Protection Agency (EPA) is a co-lead agency and the State of Washington Department of Ecology (Ecology) is the other co-lead agency. This ERA is classified as non-time critical. The proposal will follow the applicable sections of 40 CFR 300, Subpart E (EPA 1990), the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Appendix D, Work Schedule) (Ecology et al. 1993), the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), the *Resource Conservation and Recovery Act of 1976* (RCRA), the State of Washington *Model Toxics Control Act*, and *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (EPA 1993).

A non-time-critical ERA proposal includes preparation of an engineering evaluation and cost analysis section (EPA 1993). The engineering evaluation and cost analysis is a rapid, focused evaluation of available technologies using specific screening factors to assess feasibility, appropriateness, and cost.

The ERA proposal will undergo a 30-day public review and comment period. Upon public comment resolution, the EPA and Ecology will issue an Action Agreement Memorandum. The memorandum will authorize implementation of the EPA/Ecology selected remediation alternative.

1.2 SITE DESCRIPTION AND BACKGROUND

From 1943 to the present, the Columbia River has been used as a water supply by the Hanford Nuclear Reservation. The reactors (Figure 1), except 100-N, used the river water mainly for primary reactor core cooling purposes. The 100-N system provided river water to a secondary water cooling loop. All primary reactor discharge pipes contain some residual radioactive contamination (UNC 1986).

The river discharge lines are part of each reactor's effluent system. Most lines stopped operating when the associated reactor was shut down (Table 1). The K lines still service the K Area basins. The N line still services the 100-N Area.

Figure 1. 100 Area Reactor Location Map.

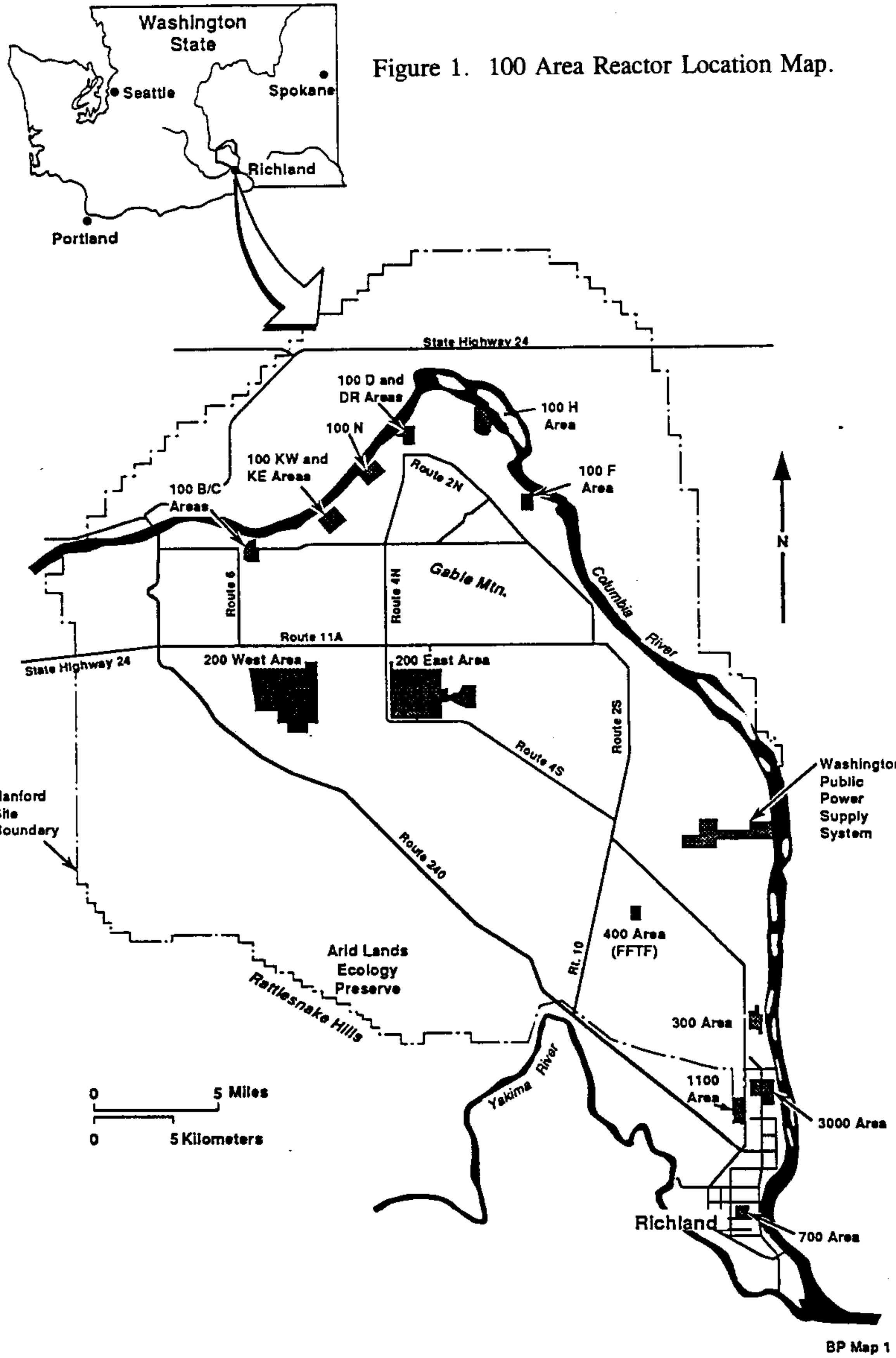

Table 1. River Discharge Line Operating Histories.

Reactor Area	Initial Reactor Startup Date	Final Reactor Shutdown Date	Years Operated
100-B	9/44	2/68	23
100-C	11/52	4/69	16
100-D	12/44	6/67	13
100-DR	10/50	12/64	14
100-F	2/45	6/65	20
100-H	10/49	4/65	15
100-KE	4/55	1/71	16
100-KW	1/55	2/70	15
100-N	12/63	2/88	25

The land portion of the effluent pipe system is underground to provide shielding protection from short-lived gamma radiation. Each line extends from its associated reactor to an outfall structure to the main Columbia River channel outlet.

Outfalls are open, reinforced concrete structures that directed the water through either the river discharge lines or through spillways. The spillways are concrete flumes used when the river lines were blocked, damaged, or undergoing maintenance.

The concrete river discharge lines ran from the outfall structure down to the river bottom level junction. Same-diameter steel pipes continued from the junction on a level run to the river outlet. Typically a shallow river bed trench was excavated. The pipe was joined using butt welds, dresser couplings, and ground jumpers. Concrete cones anchored the lines. Fill three ft thick buried the pipe. A final anchor and boulder riprap secured the pipe outlet. A smooth round lip modified the pipe mouth.

Released reactor cooling water went to a retention basin located between the reactor building and the river. Water retention permitted thermal cooling and the decay of short-lived radioisotopes prior to river discharge. As reactor production increased, the hold-up period decreased. The basins also served to hold-up flow of effluent with high radioactive isotope concentrations resulting from fuel element failure. This effluent was isolated and diverted, either by gravity or pumping, to an open pond area or crib. The pond or crib filtered the effluent through the ground.

1.2.1 Physical Description

The following descriptions are based on a 1986 inspection (UNC 1986) and a 1994 survey (WHC 1994). All effluent lines discharge underwater generally in the center of the river channel. Tables 1 and 2 summarize the pipeline history and physical data. The 14 pipelines proposed for remediation are:

- 100-B River Lines (2)
- 100-C River Lines (2)
- 100-D and 100-DR River Lines (3)
- 100-F River Lines (2)
- 100-H River Lines (2)
- 100-K River Lines (2)
- 100-N River Line (1)

Table 2. River Discharge Line Physical Data.

Area	Pipe Diameter cm(in)	No. of Lines	Total Length m(ft)	Outfall Structure Status
100-B	107(42)	1	228(750)	116B-7 Standing
100-B	168(66)	1	210(690)	116B-8 Demolished
100-C	137(54)	2	152(500)	116-C-4 Demolished
100-D	107(42)	2	564(1850)	116D-5 Standing
100-DR	152(60)	1	549(1800)	116-DR-5 Demolished
100-F	107(42)	2	91(300)	116-F-5 Demolished
100-H	152(60)	2	252(825)	116-H-5 Demolished
100-K	210(84)	2	396(1300)	1904-K Standing
100-N	259(102)	1	320(1050)	1904-N Standing

A Hanford Cultural Resources Laboratory review reports that there are no known cultural resources or historic properties within the very limited proposed project areas (PNL 1993).

1.2.1.1 B and C Pipelines. The B effluent piping consists of two outfalls (116-B-7 and 116-B-8). These outfalls feed two river discharge lines (Figure 2). From the 116-B-7 outfall the effluent discharges through a 42-in. diameter welded carbon steel pipeline with a 1/2 in. thick wall. The discharge line from the 116-B-8 outfall is a 66-in. diameter carbon steel line with a 1/2 in. thick wall.

Large cobbles and boulders cover the B-7 pipe river bed area. The 42-in. pipeline extends about 400 ft offshore with the last 40 ft exposed on the river floor. The pipeline relief where it is exposed varies 2 to 3 ft. The burial sediment depth varies from 1 to 3 ft (WHC 1994).

Large cobbles and boulders cover the B-8 river bed area. The 66-in. pipeline extends about 400 ft offshore with the last 100 ft exposed on the river floor. The pipeline relief where it is exposed varies from 1 to 3 ft. The burial sediment depth varies from 1 to 3 ft (WHC 1994).

1.2.1.2 C Pipelines. The C effluent system discharges from the 132-C-2 outfall through two 54-in. diameter steel lines with 1/2 in. thick walls (Figures 2 and 3).

Large boulders that project up to 3 ft above the river bed are present throughout this site. The two 66-in. parallel pipelines extend about 300 ft offshore. Both pipes are exposed at various locations along the pipe run. The sediment burial depth for both pipes varies from 1 to 3 ft (WHC 1994).

A pipe scraping sample had 937 pCi/g gross Beta and 12 pCi/g gross Alpha counts (UNC 1886).

1.2.1.3 D and DR Pipelines. The D and DR effluent piping has two outfall structures (116-D-5 and 116-DR-5) feeding three river discharge lines (Figures 4, 5, and 6). From the 116-D-5 outfall, the effluent discharges through two 42-in. diameter reinforced concrete/steel pipes. The steel pipe has 1/2-in. thick walls. From the 116-DR-5 outfall the discharge line is a 66-in. diameter carbon steel line with a 1/2 in. thick wall. The three pipelines pass through the 100-D island and discharge into the main river channel.

The river bed along these two parallel pipe runs appear to be relatively smooth and are covered with sand, gravel, and cobbles. The pipe runs are about 500 ft apart. Both pipe runs extend about 1300 ft into the river. The D pipe run contains two 42-in. pipelines buried along the entire run to a depth of about 2 to 7 ft without the outlets exposed on the river bed. The DR pipe run consists of one 60-in. pipeline buried along the entire run from 2 to 6 ft with the outlet exposed on the river bed (WHC 1994).

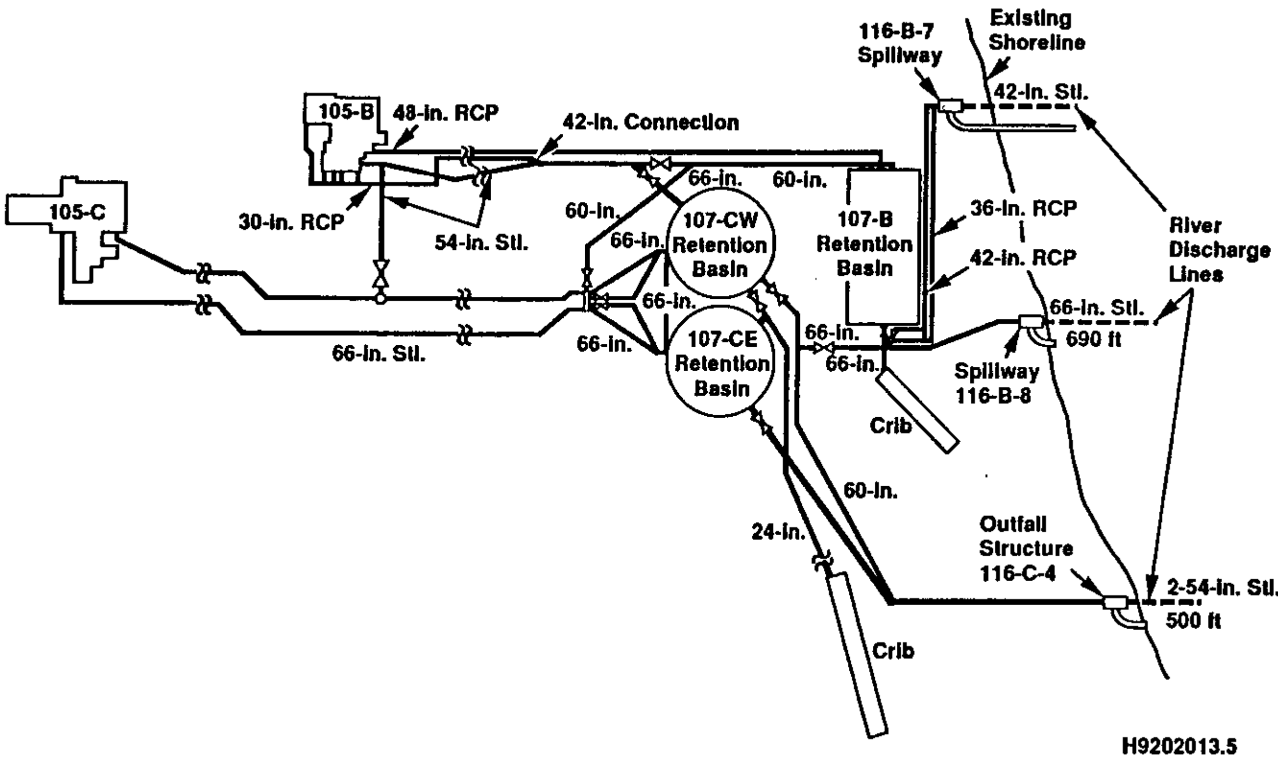

Figure 2. Reactor Retention Basin System, B and C Reactors

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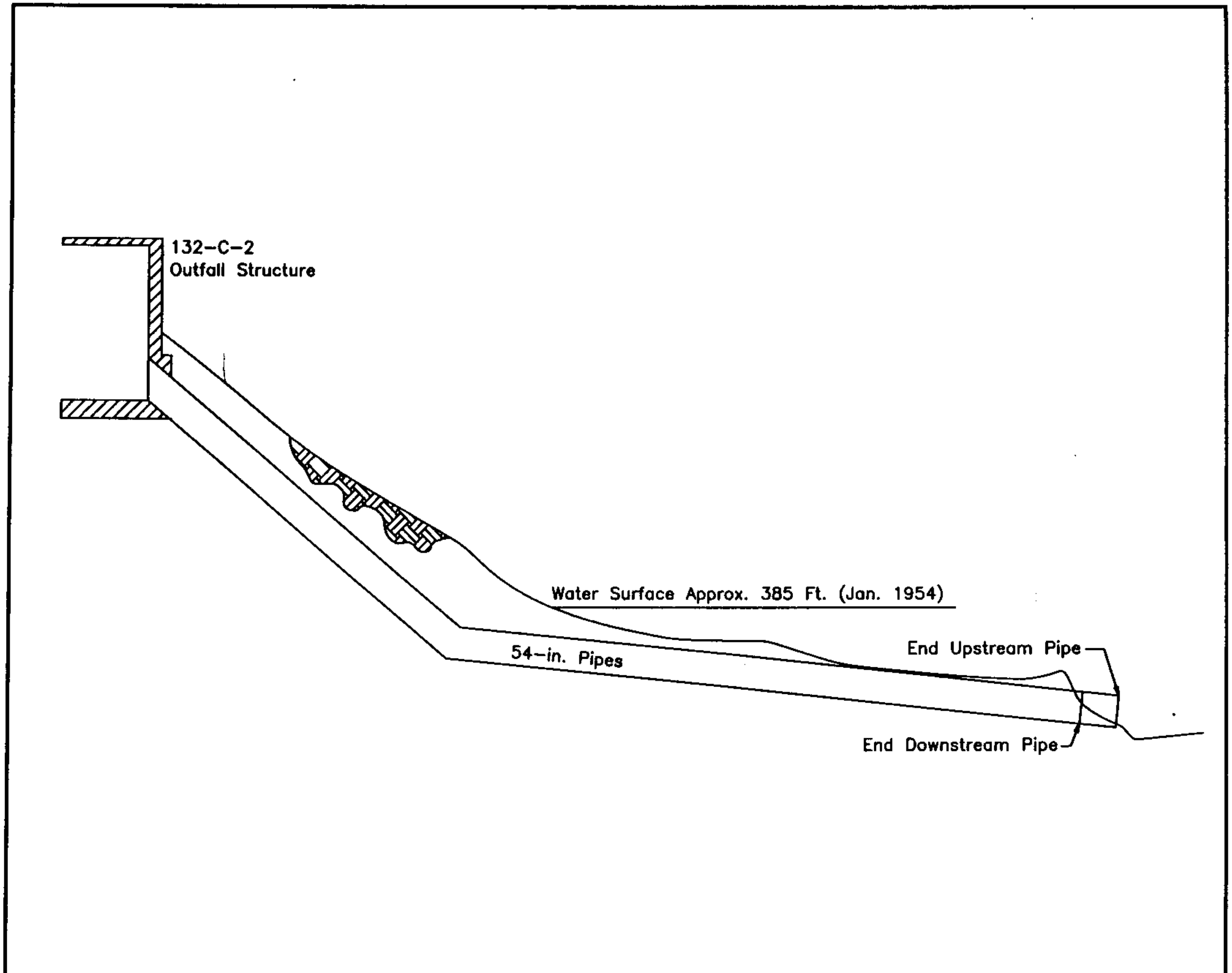

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Figure 3. Profile 116-C-4 Outfall to River

Figure 4. Effluent System, D and DR Reactors.

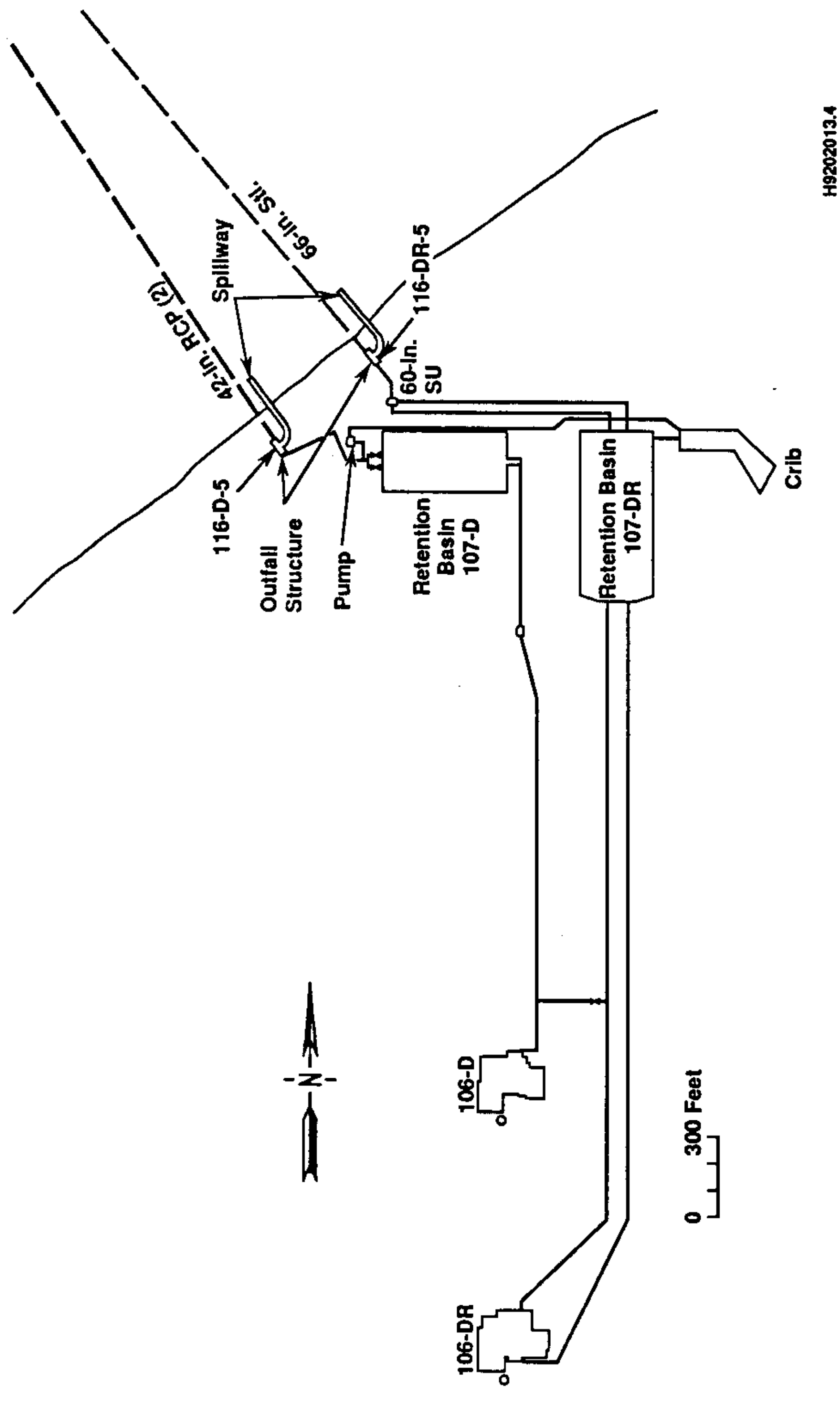

Figure 5. Profile 116-D-5 Outfall to River.

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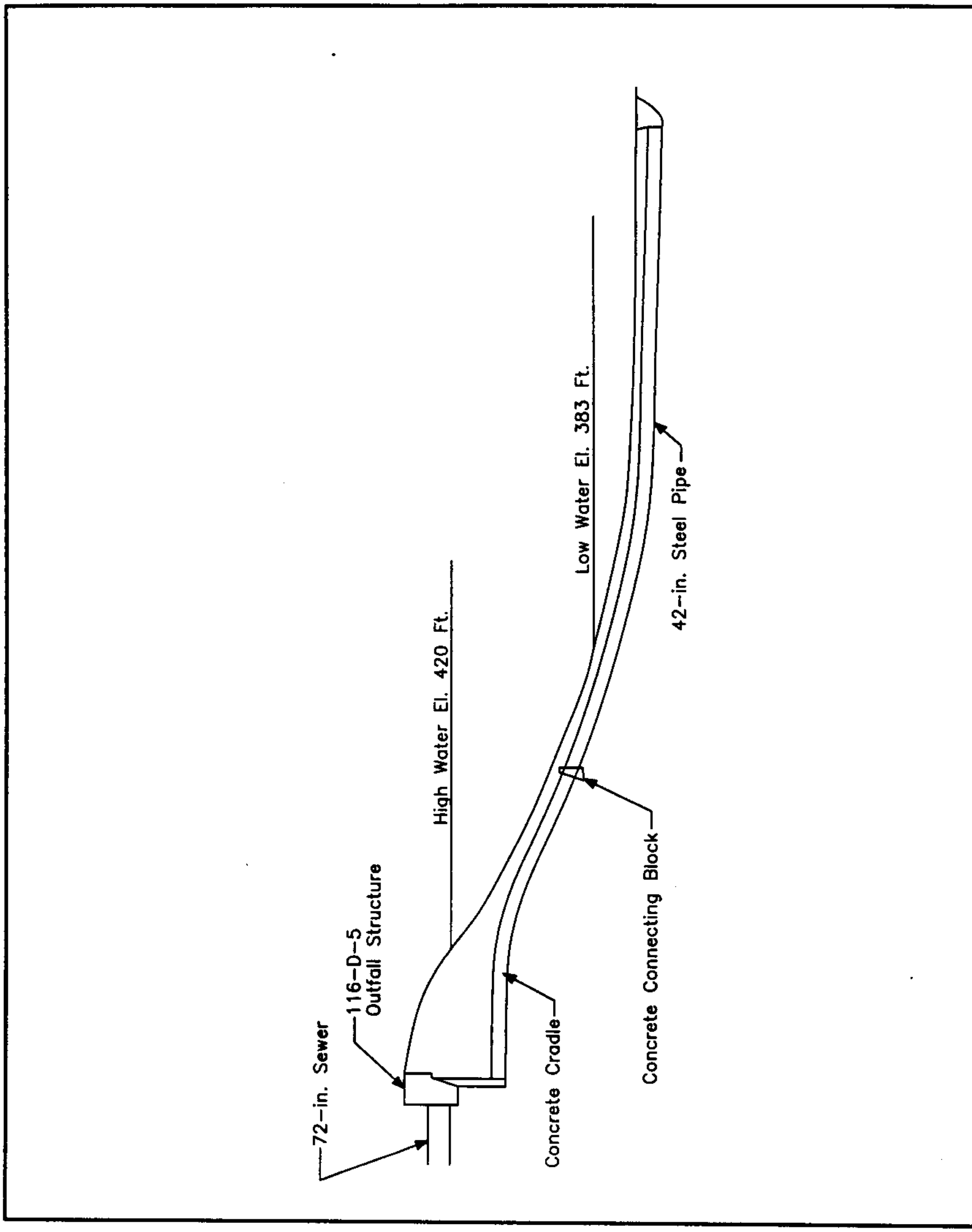

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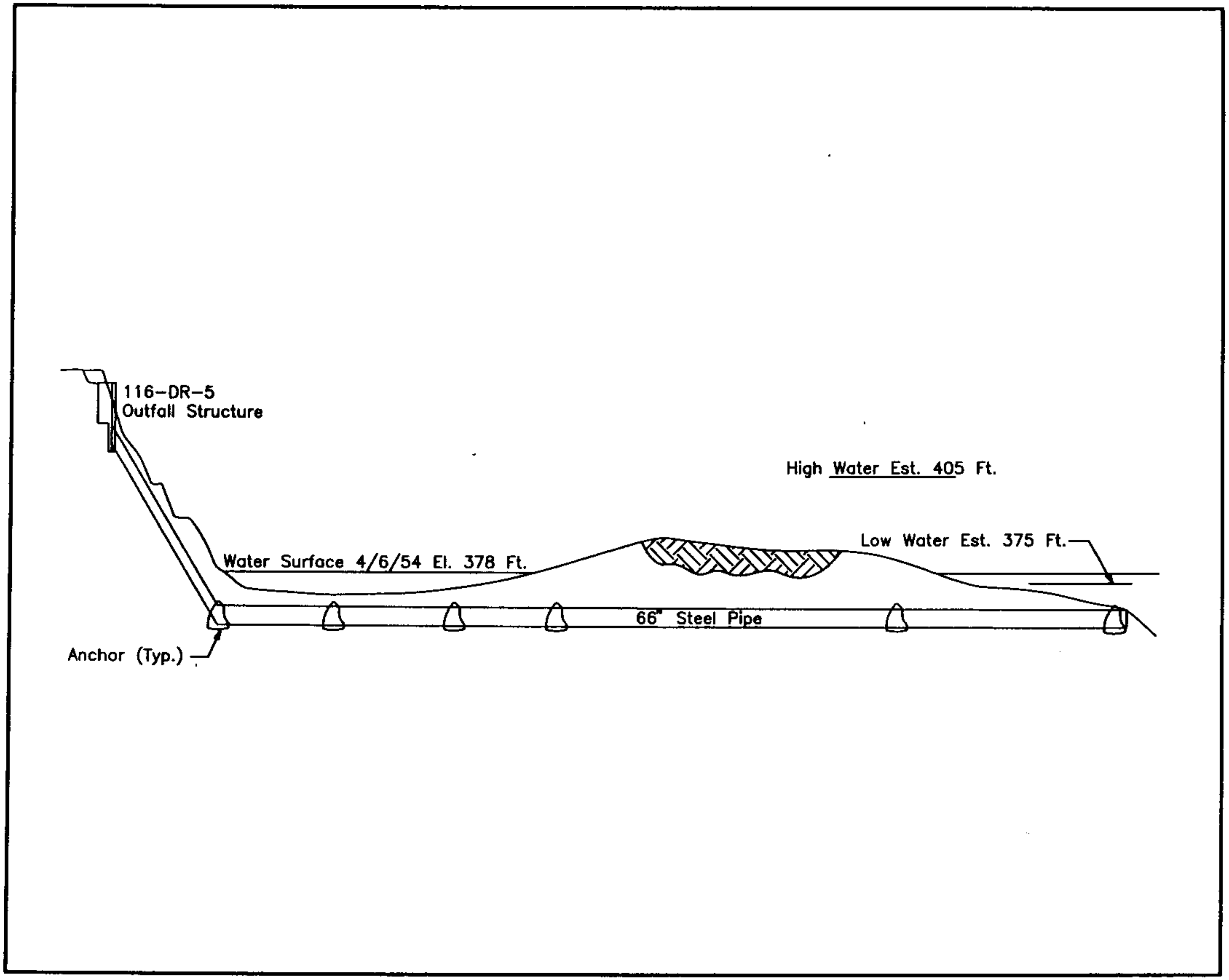

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Figure 6. Profile 107-DR Outfall to River.

A pipe scraping sample had a 799 pCi/g gross Beta and 6 pCi/g gross Alpha counts (UNC 1986).

1.2.1.4 F Reactor Pipelines. The F effluent system has the 116-F-8 outfall feeding two lines (Figures 7 and 8). The discharge is through two 42-in. diameter reinforced concrete/steel pipe lines. These pipes have 1/2-in. thick walls. Concrete anchors stabilize the pipelines.

The two 42-in. parallel pipelines extend 300 ft. The side-scan radar shows the river bed to be smooth. The two pipes and associated structures extend about 80-ft offshore and protrude 4 to 8 ft above the river bed. No buried or exposed pipelines could be found further offshore with any of the geophysical instruments. The two pipelines could not be clearly identified, possibly due to what appears to be large pieces of debris or rip-rap resting on them (WHC 1994).

A pipe scraping sample had 2919 pCi/g gross Beta and 27 pCi/g gross Alpha counts (UNC 1986).

There are broken pipe sections buried on the river bank just upstream of the outfall structure. The broken pipe sections are marked with stakes.

1.2.1.5 H Pipelines. The H effluent system consists of the 116-H-5 outfall structure with the discharge piping being two 60-in. diameter carbon steel lines with 1/2 in. thick walls (Figures 9 and 10). In the early 1960's the 100-H Area lines were re-anchored and buried after trapped air floated them out of place.

The river bed at this site consists of cobbles with occasional large boulders. The two 60-in. diameter pipelines extend about 500 ft into the river. Both pipelines are buried along the entire alignment at a depth of 3 to 8 ft. There is no evidence on the side-scan sonar, ground penetrating radar (GPR), or bathymetric data that the pipeline outlet ends are exposed on the river bed (WHC 1994).

1.2.1.6 K Pipelines. The K effluent system consists of the 116-K-3 outfall structure discharging into two welded, 84-in. diameter carbon steel lines with 1/2 in. thick walls (Figure 11).

This site's river bed consists of large cobbles, boulders, and possible other debris. The two 84-in. pipelines extend about 250 ft into the river. The pipelines are exposed along most of the run. The pipelines protrude 1 to 3 ft above the river bed at these exposures (WHC 1994).

Figure 7. Effluent System, F Reactor.

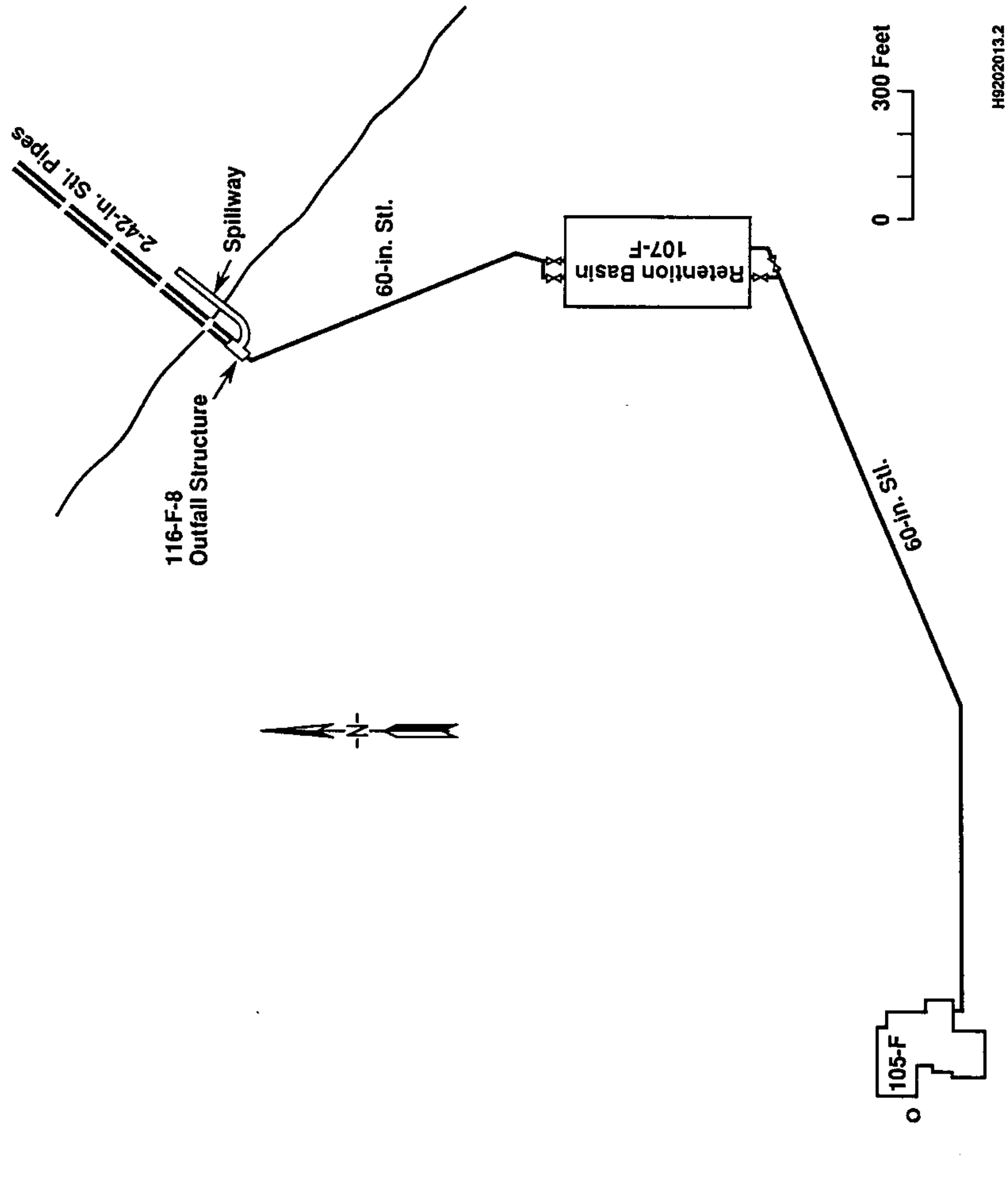


Figure 8. Profile 116-F-8 Outfall to River.

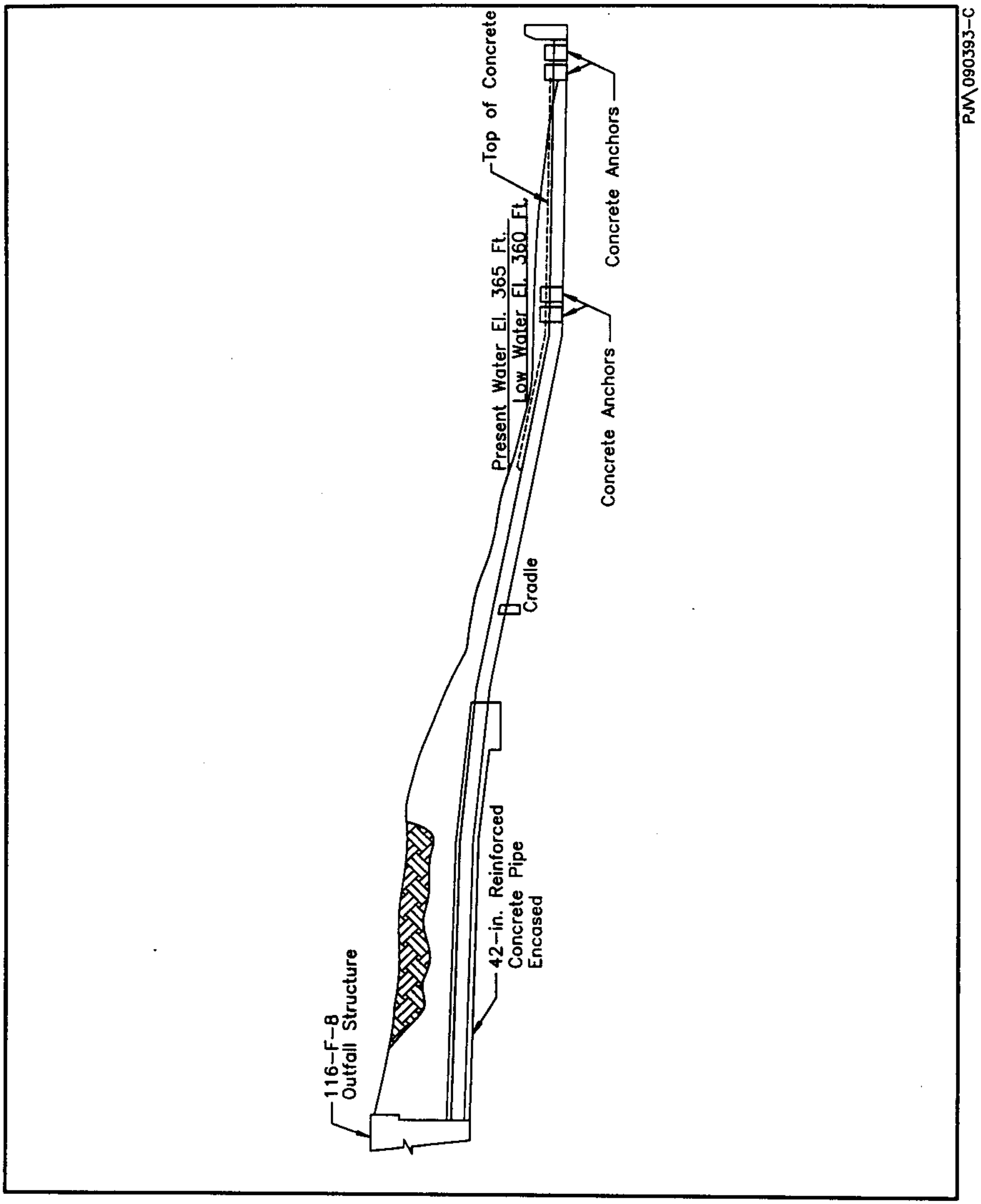
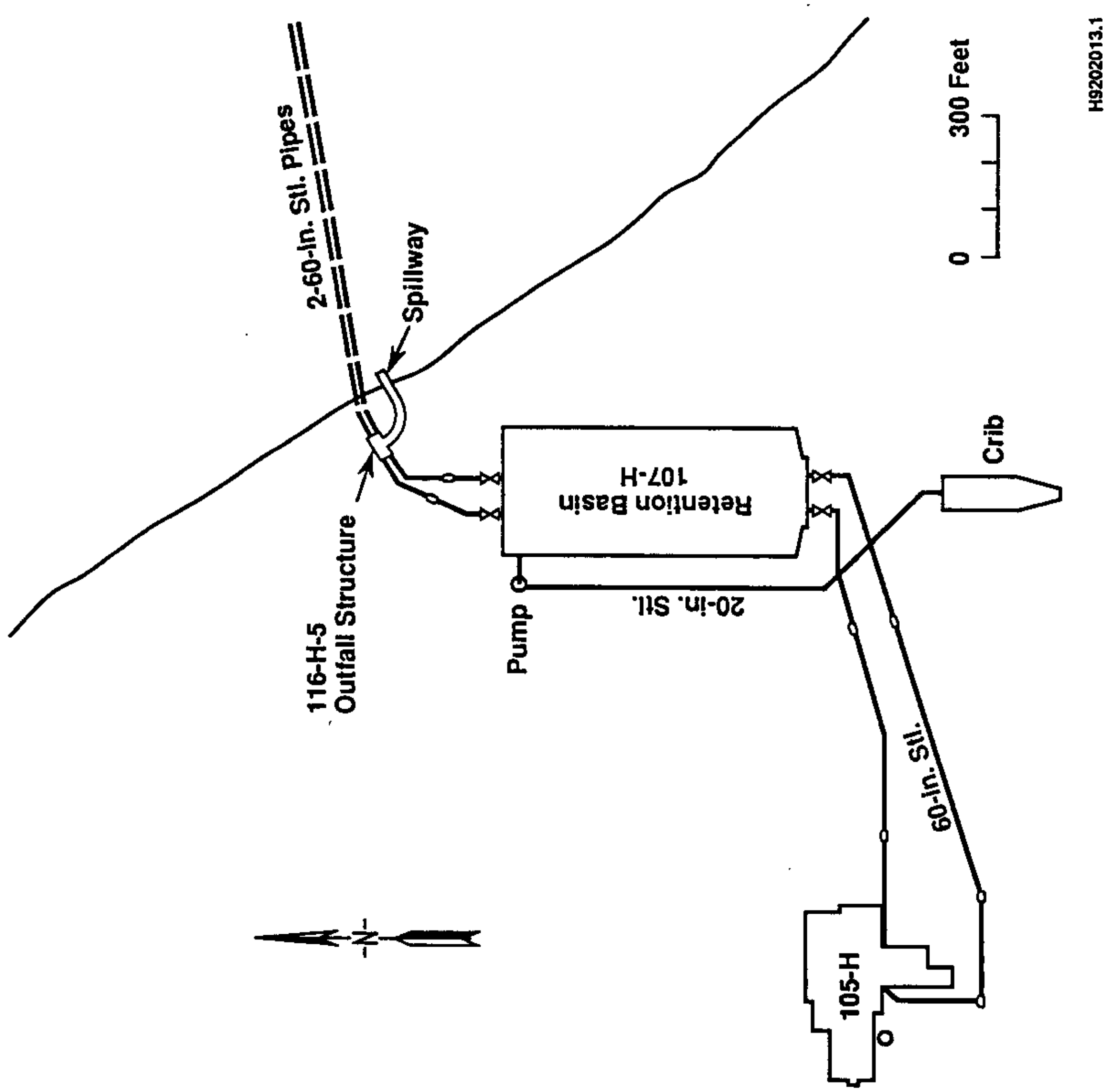


Figure 9. Effluent System, H Reactor.



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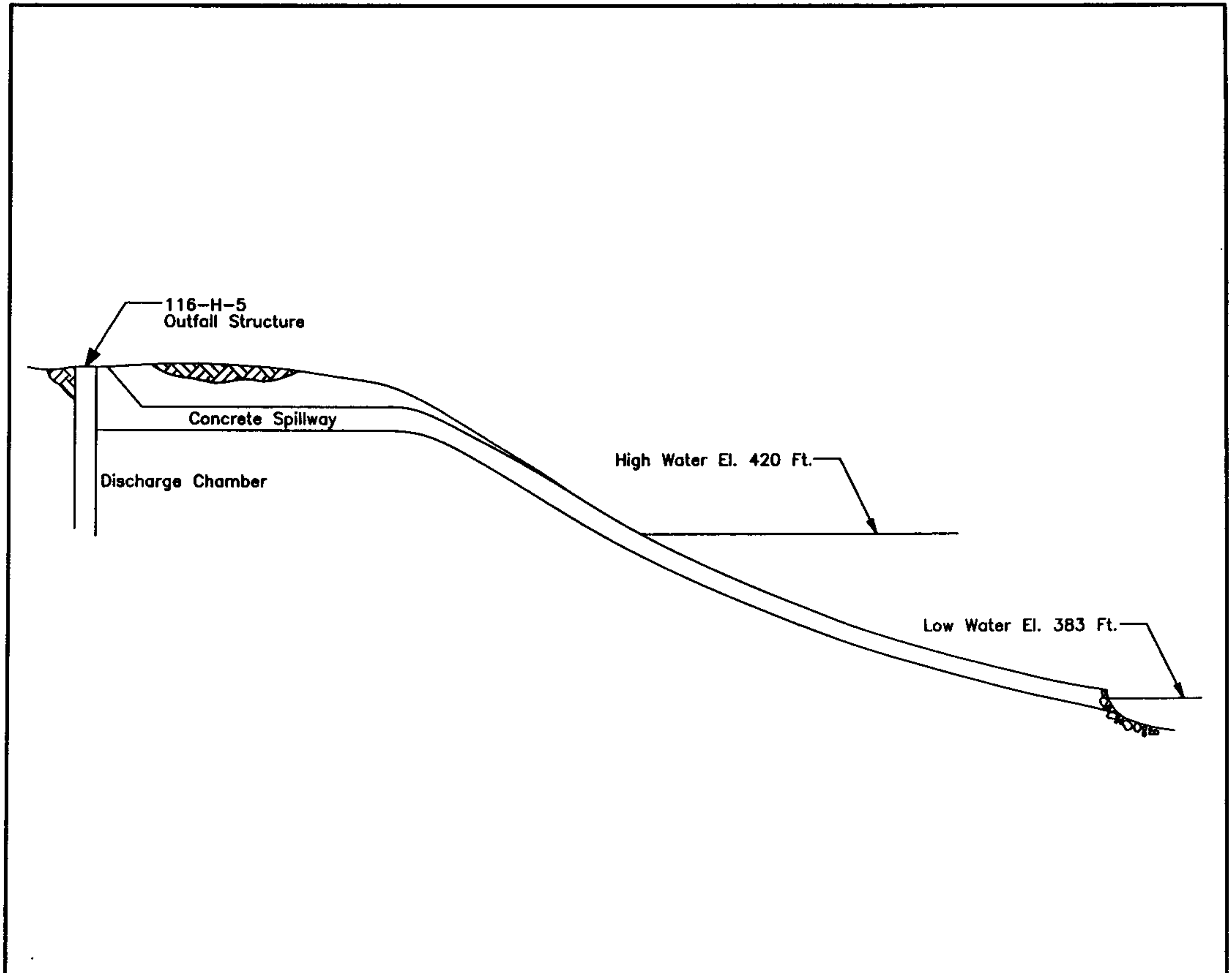

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Figure 10. Profile 116-H-5 Outfall to River.

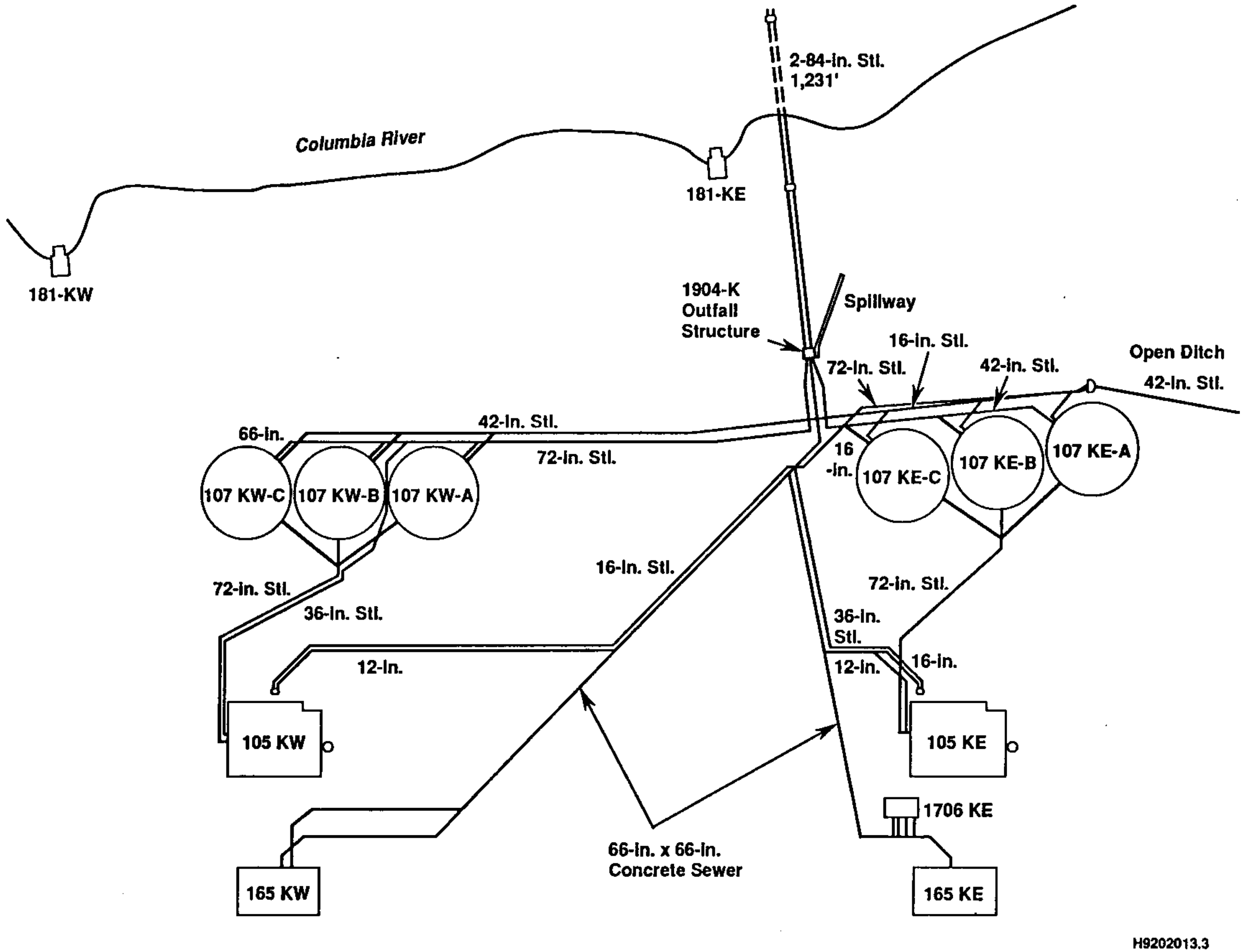

Figure 11. Reactor Retention Basin System, K Reactors.

1.2.1.7 N Pipeline. The 102-in. outfall line is a discharge point (Outfall Number 009) which disposed raw river water used to cool the secondary cooling water for the N reactor. The discharge line extends approximately 400 ft into the Columbia River and turns upward where water is discharged through a 13 ft. port.

The river bed is covered with cobbles and patches of large boulders. The 102-in. pipeline could not be imaged with the GPR. The GPR did work successfully at all the other sites. Two images on the Bubble Pulser data are interpreted to be the pipeline. They show the pipeline to be 8 to 10 ft below the surface, which is the GPR maximum capability limit. The pipeline outlet is exposed on the river floor and has a relief of 3 to 4 ft (WHC 1994).

1.2.2 Surface Water Hydrology

Flow in the Columbia River is relatively swift at the effluent pipe outlets. The flow is regulated by Priest Rapids Dam. River levels vary as much as 1.5m (5 ft) daily. A complete description is presented by Cushing (1991). Columbia River recorded flow rates range from about 4,500 to 18,000 m^3/s (158,000 to 635,000 ft^3/s) during spring and early summer runoff to about 1,000 to 4,500 m^3/s (35,300 to 158,999 ft^3/s) during the late summer and fall low flow season. A 1,020 m^3/s (36,000 ft^3/s) is maintained along the Hanford Reach.

1.2.3 Sensitive or Critical Habitat

Wetlands habitat exists in the Columbia River riparian zone. This zone supports stands of willows, grasses, aquatic macrophytes, and other plants. The wetlands along the river are impacted by seasonal and dam controlled fluctuations in water level.

A 100 Area Ecological Study (WHC 1993) did not identify any species of concern in the immediate project areas. Prior to any field activities starting, additional surveys will ensure that no endangered species are impacted by remediation activities.

1.3 CHARACTERIZATION

1.3.1 River Discharge Lines Characterization Report

In the early spring of 1984 the deactivated effluent water discharge lines (river lines) for the 100-C, 100-DR, 100-F, and 100-H Areas were radiologically and physically characterized by UNC Decommissioning Services and Suboceanic Consultants, Inc. (UNC 1986).

The subcontractor located the lines; verified their size, number, and position; assessed their condition; and collected pipe sections and sediment samples. These activities showed that pipe segments were missing from the 100-F pipelines. This missing pipe section was later discovered, during an effort separate from these characterization activities, buried on the river bank upstream of the spillway.

It is not clear if the contractor filled in the pipe segment holes and pipe with fill material or covered the holes and contoured the immediate area. An internal pipe inspection would clarify the configuration.

The predominate isotopes in the lines are Europium-152 and -154. The highest concentrations came from interior pipe scraping samples. For each sample tested, the isotopic concentrations in the sediment were less than in the scrapings. Most of the activity seemed to be fixed within the rust on the interior pipe surface, from which the scrapings were collected. Table 3 lists the radiological data from the sampled 100-C, 100-DR, and 100-F pipelines.

The contact dose rate on the outside of the pipe surface was zero. The contact dose rate on the interior surface was less than 1 mrem/hr.

1.3.2 PIPELINE RIVER GEOPHYSICAL SURVEY

A comprehensive marine geophysical survey, using navigation and echo sounding, side-scanning sonar, subbottom profiling, seismic reflection profiling, and ground penetrating radar, located and mapped the 14 effluent pipelines. It appears that all the pipe trenches were not filled in completely. These river bed irregularities are apparently causing turbulent flow conditions over the pipe trench locations.

1.4 RISK ASSESSMENT

Risk is a combination of exposure and toxicity. If an exposure pathway from the source to a receptor (human or ecological) does not exist there is no risk. Also, if the constituent has no toxic effect on the receptor there is no risk, even when an exposure pathway is possible. The radionuclide levels inside the pipeline could pose a risk for some pathways. This section reviews the following potential exposure pathways: ingestion, inhalation, and external exposure from gamma emitting radionuclides for humans or fish under current conditions and under future conditions if the pipes break loose.

Physically, the pipelines are open at the outlets. These holes and other structures associated with the pipes (such as concrete anchors) provide habitat for aquatic life. The fish that are the most likely to benefit from thise habitat are squawfish. They are a significant

Table 3. 1984 Radiological Data.

SITE	Sample Type	Isotope	1984 pCi/g value (1994 decayed value)	Activity Level Direct dpm/probe	Activity Level Smear dpm/100 cm^2	Gross Beta/Alpha pCi/g
100-C	Inner Pipe Surface			33,000	6,700	
	Loose Scale	Co-60 Eu-152 Eu-154 Eu-155	150(40) 3,400(1907) 580(376) 51(1)			
	Pipe Scrapings	Co-60 Eu-152 Eu-154 Eu-155	600(160) 7,700(4320) 1,300(843) 150(3)			937 Beta 17 Alpha
100-DR	Inner Pipe Surface			30,000	6,700	
	Loose Scale	C0-60 Cs-137 Eu-152 Eu-154 Eu-155	150(40) 25(4) 1,700(954) 310(201) 16(<1)			
	Pipe Scrapings	C0-60 Cs-137 Eu-152 Eu-154 Eu-155	670(180) 28(6) 7,000(3927) 1,200(778) 83(2)			799 Beta 6 Alpha
100-F	Inner Pipe Surface			20,000	10,000	
	Loose Scale	C0-160 Eu-152 Eu-154 Eu-155	120(32) 6,500(3647) 1,000(649) 73(2)			
	Pipe Scrapings	Co-60 Eu-152 Eu-154 Eu-155	330(88) 12,000(6732) 1,900(1232) 93(2)			2919 Beta 27 Alpha

Current Activity Level = Data Collection Activity Level X $e^{-\lambda T}$

λ = 0.693/Isotope Half Life Constant

T = Time duration from data collection time to desired current time.

predator of young salmon (Wydoski and Whitney 1979). Sturgeon also might enter the pipes, to rest out of the current.

The toxicology of the radionuclides within the pipes would be of little concern from ingestion or inhalation routes for either humans or fish, since they evidently do not get flushed into the main body of the river and are in particulate form. No dose is calculated for humans since no current pathway exists. Because the 1986 characterization report (UNC 1986) reported a contact dose rate for the pipes' interior surfaces (once they are out of the water and dry) to be less than 1 mrem/hr, there is no reasonable pathway of concern to human health if the pipes remain stable.

The only pathway of potential significance is for fish such as sturgeon and squawfish, which may enter the pipes and rest for a time. If they do, they could be exposed to radiation from the radionuclides present. The potential exposure would be small, external, occasional, and to individual fish rather than the population. Squawfish, which are most likely use the pipelines as a more permanent habitat than are sturgeon, could be exposed for longer periods than sturgeon. However, the ecological concern is not that the pipes might harm the squawfish, but that the pipes provide habitat for an undesirable fish.

If the pipes break loose and scale particles are flushed to the river, most particles will spread in the river, probably settling out in backwater areas (such as sloughs) and in McNary pool. Because the quantity of the sediment and scale is not known, the distribution in the river is impossible to calculate. However, since the particles would diffuse in the current, the dose is not likely to be significant, and possible ingestion of fine particles that remain suspended would be the potential pathway for humans (for example, while water skiing) and fish.

In summary, this risk assessment does not show any threat to the general public or environment. It does show a minor threat to an individual person or fish coming in direct contact with the interior pipe scale.

2.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

2.1 ERA GOAL

The ERA goal is to remove and/or stabilize the 100 Area Reactor river discharge lines and outfall structures. The action should eliminate the physical and potential radiological hazards associated with deteriorating pipeline conditions.

2.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 7.5 of the Action Plan in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1991) contains the basic description of applicable or relevant and appropriate requirements (ARAR). An ARAR summary is presented in Table 4 below. Depending on the alternative selected, not all requirements will apply.

3.0 IDENTIFICATION AND ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

3.1 REMEDIAL ALTERNATIVES

3.1.1 No Action Alternative

No action will be taken. The steel pipes will deteriorate naturally over time in the river. The outfall structures and spillways will remain in their present condition.

3.1.2 Pipe Inspection and Separate Pipe Work Plans Alternative

This alternative contains two phases. The first phase contains three steps to provide a clean shore base, inspect the pipes internally, and remove some buried pipe sections. The second phase will use the inspection data to write a report providing separate remediation work plans for each pipe run. Individual pipe run work plan completion will follow report approval by Ecology and EPA.

3.1.2.1 Phase One. The first step is excavation and radioactive decontamination of each effluent pipe outfall structure and spillway. This provides a radiation-free clean shore base for operations support.

The second step is performing an internal pipe underwater robotic inspection that documents each pipe's interior condition from the outfall to the river outlet. These pipe inspection activities will include video recording of the interior conditions, radiation monitoring measurements, pipe interior scale and sediment collections. The robot will access each pipe from the outfall inlet.

The third step is the excavation, inspection, decontamination, and disposal of the 100-F shoreline buried pipe segments.

Table 4. Applicable or Relevant and Appropriate Requirements.

Description	Citation	Requirements	Remarks
Section 10 Permit	33 CFR 322	Permits for structures in or work that affects navigable waters are required prior to construction.	A Corp of Engineers permit may be required.
Permits for Discharge of Dredge or Fill Material into Waters of the U. S.	33 CFR 323	Discharging dredge and fill material into U. S. waters requires a permit from Corps of Engineers.	Obtain a Corp of Engineer permit.
Nationwide Permits	33 CFR 330	Nationwide Permits regulate with little delay or documentation certain waterway activities having minimal impact.	Obtain a Shoreline Development Permit from the Corp of Engineers.
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Sets National Ambient Air Quality Standards for ambient pollutants which are regulated within the region.	
Air Standards for Particulates	40 CFR §50.6	Prohibits average concentrations of particulate emissions in excess of 50 micrograms/m^3 annually or 150 micrograms/m^3 per 24-hour period.	A potential for particulate emissions exists during outfall excavation.
National Emissions Standards for Hazardous Air Pollutants (NESHAP)	40 CFR Part 61	Establishes numerical standards for hazardous air pollutants.	
Radionuclide Emissions from DOE Facilities (except Airborne Radon-222)	40 CFR§ 61.92	Prohibits emissions of radionuclides to the ambient air exceeding an effective dose equivalent of 10 mrem per year.	Applicable to removal technologies where air emissions may occur.
Floodplains/Wetlands Environmental Review	10 CFR Part 1022	Requires federal agencies to avoid, to the extent possible, adverse effects associated with the development of a floodplain or the destruction or loss of wetlands.	A Floodplain/Wetland assessment is required.
Protection of Historic and Cultural Properties	36 CFR 800	Requires a cultural resources review.	The cultural resources review is in included in the NEPA documentation.
Fish and Wildlife Services List of Endangered and Threatened Wildlife and Plants	50 CFR Parts 17, 222, 225, 226, 227, 402, 424	Requires identification of activities that may effect listed species through a site assessment. Actions must not threaten the continued existence of a listed species or destroy critical habitat.	An Endangered Species Approval is required from the U. S. Fish and Wildlife Service.
National Primary Drinking Water Regulations	40 CFR Part 141	Establishes maximum contaminant levels (MCL) and maximum contaminant level goals (MCLG) for organic, inorganic, and radioactive constituents. The average annual concentration of beta particle and photon radioactivity from manmade radionuclides in drinking water shall not produce an annual dose equivalent to total body or any internal organ in excess of 4 mrem/year.	The Columbia River is a public drinking water supply for downstream communities.
Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977	33 U.S.C. 1251 et seq.	Creates the basic national framework for water pollution control and water quality management.	Permit may not be required for CERCLA actions. Substantive requirements must be met.
National Environmental Policy Act (NEPA)	42 U. S. C. § 4321 et seq.	Requires an evaluation of the proposed activities effects on the environment.	All proposed activities require a NEPA review.
Endangered Species Act of 1973	16 U. S. C. 1531 et seq.	Prohibits federal agencies from jeopardizing threatened or endangered species or adversely modifying habitat essential to their survival.	
Wild and Scenic Rivers Act	16 U. S. C. 1271.	Prohibits federal agencies from recommending authorization of any water resource project that would have a direct and adverse effect on the values for which a river was designated as a wild and scenic river or included as a study area.	The Columbia River Hanford Reach is under study for inclusion as a wild and scenic river.
Department of Ecology	RCW 43.21A	Vests the Washington Department of Ecology with the authority to undertake the state air regulation and management program.	
Air Pollution Regulations	WAC 173-400	Establishes requirements for the control and/or prevention of the emission of air contaminants.	Applicable if emission sources are created during remedial action.

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Table 4. Applicable or Relevant and Appropriate Requirements (contd).

Description	Citation	Requirements	Remarks
Standards for Maximum Emissions	WAC 173-400-040	Requires best available control technology be used to control fugitive emissions of dust from materials handling, construction, demolition, or any other activities that are sources of fugitive emissions. Restricts emitted particulates from being deposited beyond Hanford. Requires control of odors emitted from the source. Prohibits masking or concealing prohibited emissions. Requires measures to prevent fugitive dust from becoming airborne.	Applicable to dust emissions from cutting of concrete and metal and vehicular traffic during remediation.
Emission Limits for Radionuclides	WAC 173-480	Controls air emissions of radionuclides from specific sources.	Applicable to remedial activities that result in air emissions.
New and Modified Emission Units	WAC 173-480-060	Requires the best available radionuclide control technology be utilized in planning construction, installation, or establishing a new emission unit.	Applicable to remedial actions that result in air emissions.
Model Toxics Control Act	RCW 70.105D	Requires remedial actions to attain a degree of cleanup protective of human health and the environment. Authorizes the state to investigate release of hazardous substances, conduct remedial actions, carry out state programs authorized by federal cleanup, laws, and to take other actions.	
Hazardous Waste Cleanup Regulations	WAC 173-340	Addresses releases of hazardous substances caused by past activities, and potential and ongoing releases from current activities.	Applicable to facilities where hazardous substances have been released, or there is a threatened release that may pose a threat to human health or the environment.
Selection of Cleanup Actions	WAC 173-340-360	Establishes cleanup requirements to be included in cleanup plans. Identifies technologies to be considered for remediation of hazardous substances.	
Cleanup Actions	WAC 173-340-400	Ensures that the cleanup action is designed, constructed, and operated in accordance with the cleanup plan and other specified requirements.	
Institutional Controls	WAC 173-340-440	Requires physical measures such as fences and signs to limit interference with cleanup, and legal and administrative mechanisms to enforce them.	
Residual Radioactive Material as Surface Contamination	U.S. NRC Regulatory Guide 1.86	Sets contamination guidelines for release of equipment and building components for unrestricted us, and if buildings are demolished, shall not be exceeded for ground contamination.	
Protection and Enhancement of the Cultural Environment	Executive Order 11593	Provides direction to federal agencies to preserve, restore, and maintain cultural resources.	Pertains to sites, structures, and objects of historical, archeological, or architectural significance.
Hanford Reach Study Act	PL 100-605	Provides for a comprehensive river conservation study. Prohibits the construction of any dam, channel, or navigation project by a federal agency for 8 years after enactment. New federal and non-federal projects and activities are required, to the extent practicable, to minimize direct and adverse effects on the values for which the river is under study and to utilize existing structures.	Notify the National Park Service of proposed activities.
U.S. Department of Energy Orders			
Preoperational Monitoring of Facilities, Sites, and Operations	DOE 5400.1	Environmental study to evaluate seasonal changes is required if a project has the potential for significant adverse environmental impact.	This study may be required depending on the alternative selected.
Radiation Protection of the Public and the Environment	DOE 5400.5	Establishes standards and requirements for operations of DOE and DOE contractors respecting protection of the public and the environment against undue risk of radiation.	
Radiation Dose Limit (All Pathways)	DOE 5400.5, Chapter 11, Section 1a	The exposure of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 mrem from all exposure pathways, except under specified circumstances.	Pertinent if remedial activities are "routine DOE activities".

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Table 4. Applicable or Relevant and Appropriate Requirements (contd).

Description	Citation	Requirements	Remarks
Radiation Protection for Occupational Workers	DOE 5480.11 Section 9a	Establishes radiation protection standards and program requirements to protect workers from ionizing radiation.	
Radioactive Waste Management	DOE 5820.2A Chapters III and IV	Establishes policies and guidelines by which DOE manages radioactive waste, waste by-products, and radioactive contaminated surplus facilities. Disposal shall be on the site at which it was generated, if practical, or at another DOE facility. DOE waste containing byproduct material shall be stored, stabilized in place, and/or disposed of consistent with the requirements of the residual radioactive material guidelines contained in 40 CFR 192.	
Excavations	DOE 6430.1A	An excavation permit is required for all excavation activities.	Obtain excavation permit.
Habitat Buffer Zone for Bald Eagle Rules	RCW 77.12.655		
Bald Eagle Protection Rules	WAC 232-12-292	Prescribes action to protect bald eagle habitat, such as nesting or roost sites, through the development of a site management plan.	Applicable if the areas of remedial activities includes bald eagle habitat.
Regulating the Taking or Possessing of Game	RCW 77.12.040		
Endangered, Threatened, or Sensitive Wildlife Species Classification	WAC 232-12-297	Prescribes action to protect wildlife classified as endangered, threatened, or sensitive, through development of a site management plan.	Applicable if wildlife classified as endangered, threatened, or sensitive are present in areas impacted by remedial activities.
Water Pollution Control Act	RCW 90.48		
Sediment Source Control Consideration	WAC 173-204-400	Requires application for sediment impact zone authorizations and sets further requirements for managing sediment contamination.	Applicable to human activity that exposes or re-suspends sediments which exceed standards of WAC 173-204-304 (sec 173-204-110[3])
Sediment Management Standards	WAC 173-204	Provides regulatory and management goals for the quality of all sediments throughout the state.	Pertinent to dredging and other activities conducted in the Columbia River.
Nuclear Energy and Radiation	RCW 70.98		
Radiation Protection - Air Emissions	WAC 246-247	Requires that radionuclide emissions to the air shall not cause a dose equivalent of more than 25 mrem/year to the whole body or 75 mrem/year to a critical organ of any public member.	
Aquatic Lands lease	RCW 79.90	Any proposed uses or action involving construction, filling, dredging, drilling, mining, road construction, utility installation, or other activities within the Columbia River beds or shoreline may require an aquatic land lease and/or authorization.	

Table 4. Applicable or Relevant and Appropriate Requirements (contd).

Description	Citation	Requirements	Remarks
Dredge and Fill Regulatory Programs	33 CFR Part 323	Requires a special Army Corps of Engineers permit prior to the discharge of dredge and fill material into navigable waters.	May apply where dredge and fill material may or will be discharged to U. S. navigable waters.
Dredge or Fill Material Disposal Sites	40 CFR Part 230	Establishes guidelines to restore and maintain the chemical, physical, and biological integrity of U. S. waters through the control of dredged or fill material discharges.	Parts may be applicable where dredged or fill material can be discharged into the Columbia River or if fugitive sediments from river work impact aquatic ecosystems.
Potential Impacts on Special Aquatic Sites	40 CFR 230, Subparts C, D, and E.	Restricts dredge and fill discharge to wetlands, sanctuaries, refuges, and aquatic ecosystems.	Applicable if wetlands, sanctuaries, and/or refuges are located in areas impacted by remedial activities. The Columbia River is located adjacent to the Saddle Mountain Wildlife Refuge.
Radioactive Air Emissions Program (RAEP)	WAC 246-247	All new and modified sources of radionuclide emissions are subject to a preconstruction review and approval by the State of Washington Department of Health.	Approval for excavations is required.
Storm Water Discharge	57 FR 175	To comply with the Storm water construction regulations and Permit WA-R-10-000F, a Notice of Intent must be filed with the EPA at least two days prior to the construction start. The NOI states that the project will comply with General Permit WA-R-10-000F as written.	Meet requirements.
Hydraulic Projects	WAC 220-110	Any construction or other work that will change the natural flow of a river is required to obtain a hydraulic project approval from the Washington State Department of Fisheries.	Obtain State of Washington Department of Fisheries approval as required.
Shoreline Development	WAC 173-14 to -20	A permit for developing the shoreline prior to construction is required for shorelines not federally owned but under lease, easement, license, or other similar federal property rights short of fee ownership.	Obtain Shoreline Development Permit from Benton County.
Water Quality Modification	WAC 173-201	A permit, directive, or order, as appropriate must be obtained from Washington State Department of Ecology prior to undertaking an activity that will temporarily reduce water quality conditions and classifications established for the stream.	Obtain a Water Quality Modification Permit from the Department of Ecology as required to support the project.
Dangerous Waste	WAC 173-303	New Hanford treatment, storage, disposal units (TSD) not identified in the Tri-Party Agreement will require development of a permitting plan to detail the strategies and schedules to develop the necessary dangerous waste permits.	Any generated regulated waste will be managed under RCRA in accordance with WAC 173-303.

3.1.2.2 Phase Two. The second phase will use the inspection data to write an effluent pipeline remediation report. This report will provide detailed individual pipe run remediation work plans, associated costs, and schedules. These work plans could include combinations of the following actions to correct concerns identified during the inspection phase:

A. Radiological decontamination of pipe interior to clean release standards. This can be accomplished using a robot with a wire brush encased in a vacuum head. The vacuumed sediments and water would be filtered to collect the sediments. Sediment disposal would be as Low Level Waste.

B. Backfill the pipe interiors with grout, cement, or rock to further anchor the pipe to the river bed.

C. Plug the river outlet and shore inlet with rock, cement, or grout.

D. Demolish the associated outfall structure and spillway following completion of the corrective action for each pipe. Recycle the concrete.

A possible work plan scenario (assuming there is no contamination problem) is to seal the pipe ends and demolish the outfall structure and spillway.

Upon report approval by EPA and Ecology, work plan implementation will start.

3.1.3 Pipe Removal Alternative

Install water tight coffer dams to allow river bed pipe removal. Seal the exposed pipe ends to prevent any potential radioactivity contamination spread during removal operations. Removal activity schedule will have minimal impact on fish migrations and native fish habitat. Scheduling for the January - February time period each year until the removal actions are complete will protect the fish migrations. Excavate and decontaminate the 100-F steel pipe sections on shore and dispose of as scrap metal. Demolish the associated outfall structure and spillway for each pipe. Recycle the concrete.

3.2 EFFECTIVENESS

3.2.1 No Action Alternative

There is a lack of knowledge about the existing condition of and contamination levels in all the pipes. The No Action alternative will not fill the knowledge void. Thus, there is no positive assurance that taking no action will protect the public and environment. The No Action alternative will not be considered further in this document.

3.2.2 Pipe Inspection and Separate Pipe Work Plans Alternative

This alternative will provide information about the existing pipe conditions. This knowledge will in turn allow creation of individual pipe remediation work plans. The work plans will insure full protection to the public, environment, and workers performing the tasks. The work plans will comply with all ARARs. This alternative will meet the ERA goal.

3.2.3 Pipe Removal Alternative

This alternative will protect the public and workers. Due to the river flow disruption caused by the coffer dams, this alternative will require careful engineering and river flow control to minimize impacts to the river bed. It will comply with all ARARs and meet the ERA goal.

3.3 IMPLEMENTABILITY

3.3.1 Pipe Inspection and Separate Pipe Work Plans Alternative

The phase one outfall construction activities will consist of excavating and decontaminating the outfall structures. Equipment and personnel are available to perform these activities. The permitting requirements will be just the basic construction activity required permits.

The robotic inspection activities equipment and personnel are available on site. No permits should be required for this inspection and sampling activity.

Removal of the 100-F pipe sections will require some excavation and decontamination activities. Permits will be required to support this activity. Equipment and personnel are available on site to remove these pipe sections.

Phase one activities could start within 3 months of issuance of the Action Memorandum by EPA and Ecology, and funding, personnel, and equipment availability.

Phase two requirements will depend on the approved work plan report. These work plans will identify the equipment, personnel, schedule, and permit requirements. Until these plans are generated, scheduling and costs requirements can not be accurately identified.

3.3.2 Pipe Removal Alternative

The removal activities will use standard river pipeline construction techniques. Equipment and personnel are available in the region to perform these removal tasks. Close attention to detail will be maintained to minimize river sediment disturbances. Permits will be required as identified in the ARAR section.

3.4 COST

These costs estimates do not include costs incurred in preparing this document. Detailed cost estimates are provided in Appendix B.

3.4.1 Pipe Inspection and Separate Pipe Work Plans Alternative

Estimated costs to complete phase 1 is $2,113,000.00. After phase 1 is complete, the individual pipe work plans will include new cost estimates.

3.4.2 Pipe Removal Alternative

Estimated costs to complete is $41,037,000.00 (ACE 1994).

4.0 COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

An analysis of the two alternatives shows that public and worker health and safety concerns can be adequately addressed. The work procedures to accomplish either alternative will cover these issues.

Removing the pipelines from the river bed will create environmental concerns as to the impact on salmon migration and downstream salmon nesting beds. When the 300 Area Treated Effluent Disposal Facility's outfall system was installed in January 1994, river activity was restricted to the months of January and February. This activity period, requested by the Washington State Fish and Wildlife Service, would have minimal effect on migrating salmon. Any damage to downstream salmon spawning areas could have long term impacts.

Both alternatives can be implemented in acceptable time frames.

A cost comparison between the two alternatives shows the Pipe Inspection and Separate Work Plans alternative to be the most cost effective, providing the decision is made not to remove all the pipes.

Table 5 below summarizes the comparative analysis.

5.0 RECOMMENDED REMEDIAL ACTION ALTERNATIVE

The preferred alternative is to perform the Pipe Inspection and separate Work Plans alternative. After phase 1 is completed, a "Phase 1 Findings Report" detailing the inspection results and recommended pipe remediation work plans will be issued. The report's work plans will include permit requirements, costs, and schedule. This appears to be the best alternative to protect the environment and be cost effective.

Table 5. Alternative Comparative Analysis.

Criteria	Pipe Inspection and Separate Work Plans	Pipe Removal
Effectiveness		
Protects Public Health	Yes	Yes
Protects Environment	Yes	Disruption of river flow and river bed sediments may damage salmon downstream spawning areas.
Residual Effect Concerns	No residual impacts are expected unless it is decided to remove the pipes from the river bed.	Any damage to downstream salmon spawning beds could take years to correct by natural means.
Implementability		
Technically Feasible	Yes	Yes
Availability	Yes	Yes
Administrative Feasibility	Yes	Yes
Cost	$2,113,000.00 plus Phase 2 costs.	$41,037,000.00

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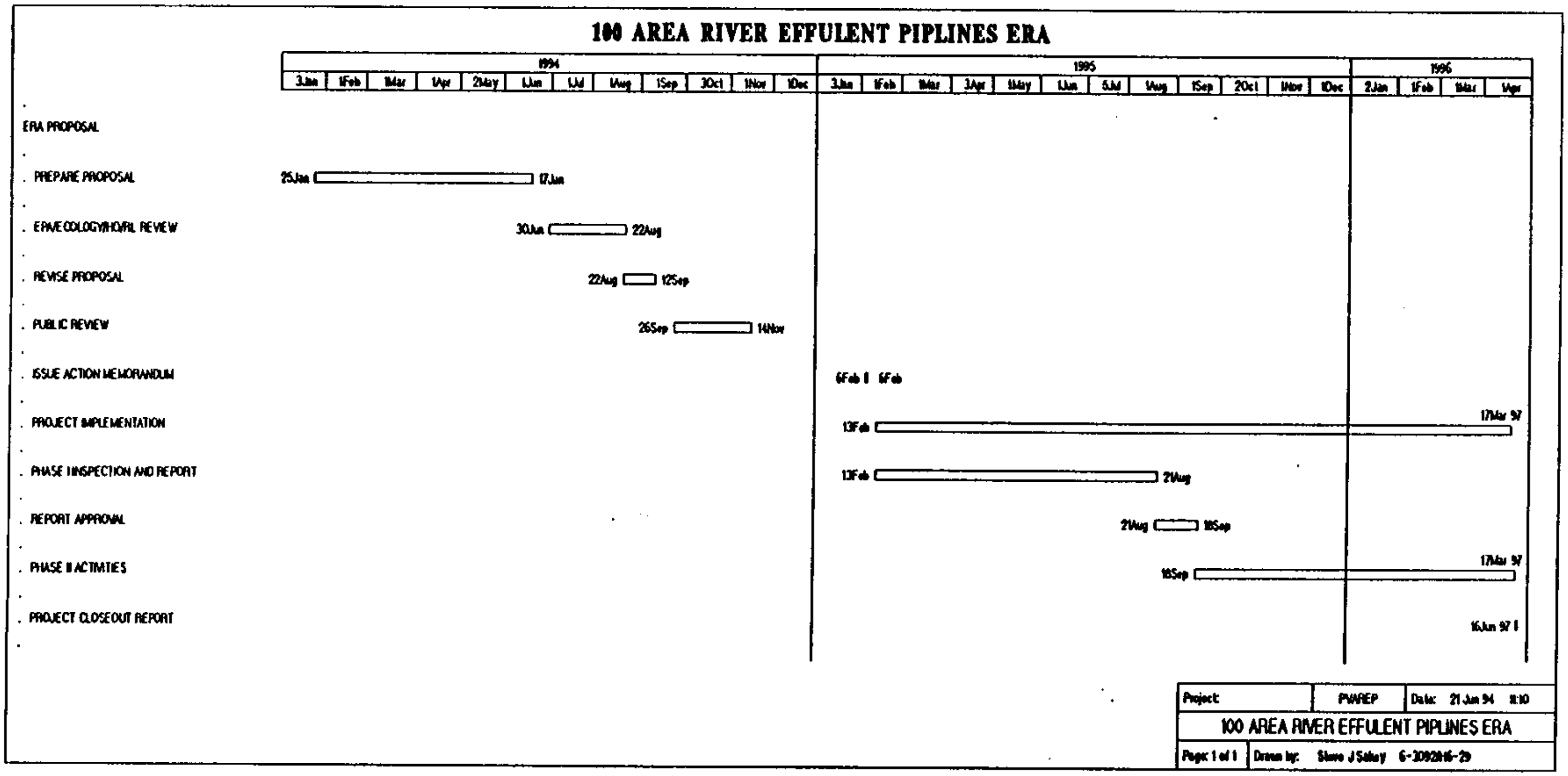
6.0 SCHEDULE



7.0 REFERENCES

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Appendix A

Federal Facility Agreement and Consent Order

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Change Number	Federal Facility Agreement and Consent Order Change Control Form	Date
M-16-93-01	Do not use blue ink. Type or print using black ink.	Sept. 30, 1993

Originator

Julie Erickson

Phone

376-3603

Class of Change

[ ] I - Signatories [X] II - Project Manager [ ] III - Unit Manager

Change Title

Effluent Pipeline Expedited Response Action

Description/Justification of Change

Add to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) the following milestone:

M-16-80
Submit to the U.S. Environmental Protection Agency and the State of Washington Department of Ecology the Engineering Evaluation/Cost Analysis (EE/CA) for 100 Area Reactor Effluent Pipeline Removal.

Due: September 1994

Impact of Change

The action should eliminate the physical and potential radiological hazards associated with deteriorating conditions of the pipelines. Broken sections of the pipeline could become a physical hazard to tribal and recreational uses of the river.

Affected Documents

Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Action Plan, Appendix D, Work Schedule.

Approvals ___ Approved ___ Disapproved

_______________ DOE	_______ Date
_______________ EPA	_______ Date
_______________ Ecology	_______ Date

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Description/Justification of Change (Continued)

Effluent Pipeline Expedited Response Action

Action

Removal and/or stabilization of the 100 Area Reactor river discharge lines and outfall structures. The action should eliminate the physical and potential radiological hazards associated with deteriorating conditions of the pipelines. Broken sections of the pipeline could become a physical hazard to tribal and recreational uses of the river.

Background

The river discharge lines were constructed as part of each reactor area process effluent system and operated until the associated reactor was shut down. The pipelines are under or on the river bed and need to be stabilized or removed. The pipelines are no longer in use and information indicates the pipes' structural integrity is poor. Additionally, residual contamination is present primarily as scale inside the pipelines. In 1986 the radiological and physical characteristics of the pipelines were assessed. The location, size, and number of the pipes were verified and the conditions assessed. It was found that pipe segments were missing from the 100-F pipelines, which were later discovered downriver. All pipelines at the time were suffering from the deteriorating conditions from river action. The pipes and their anchors were being undermined and will eventually give way.

Health Physics surveyed the pipes and analyzed sediments and scraping samples to determine the radionuclides inventory. The predominate isotopes in the pipelines were europium-152 and -154. Most of the activity seemed to be fixed within the rust on the interior pipe surface from which the scrapings were collected. Sediment samples indicated that isotopic concentrations were less in the sediment than in the pipe scrapings. The contact dose rate on the outside of the pipe surface was zero. The contact dose rate on the interior surface was less than 1 mrem/h.

Scope

Engineering studies will be conducted to evaluate the alternatives for stabilization or removal of the river discharge pipelines. These studies will follow the Expedite Response Action non-time critical implementation pathway. Studies will consider the ecological and human health risks associated with in-place stabilization or removal of the pipes. Additionally, the permitting requirements will also be evaluated to determine schedule and cost impacts.

Assumptions

- Cost and schedule for pipeline and outfall removal will be addressed in the EE/CA.
- A remedial alternatives risk assessment will be performed.

Schedule

- M-16-80 Prepare and issue the EE/CA study by September 1994.

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Appendix B

Cost Estimates

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1. Pipe Inspection and Separate Pipe Work Plans Alternative

Phase 1		
●	Excavate and decontaminate the outfalls and spillways	$ 1,113K
●	Robotic Inspection	500K
●	30% Contingency	500K
	Phase 1 total	$ 2,113K

Phase 2

2. Pipe Removal Alternative

Remove Pipelines		
●	B/C	$ 5,564K
●	D/DR	13,604K
●	F	2,040K
●	H	3,204K
●	K	12,144K
●	N	4,481K
Total		$ 41,037K

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